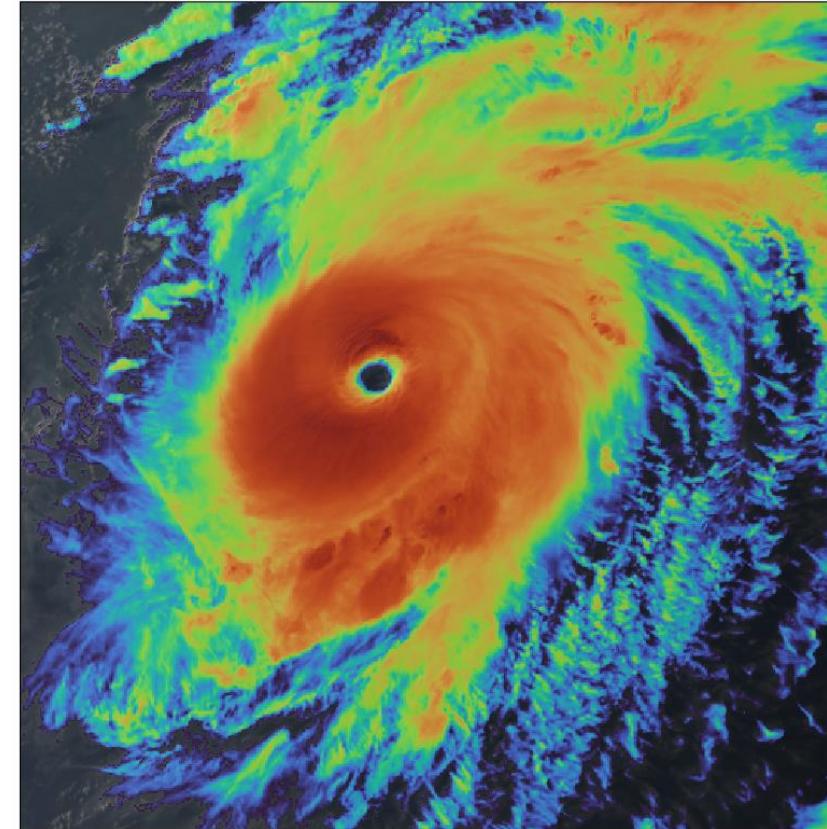
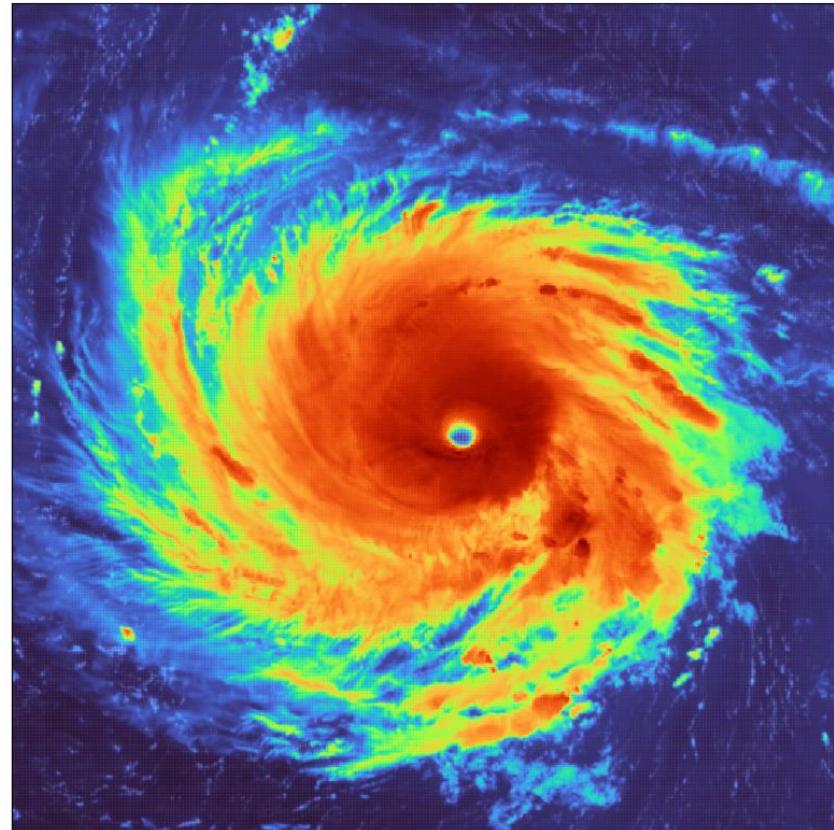


Investigating Lightning Behavior in Rapidly Intensifying Atlantic Tropical Cyclones

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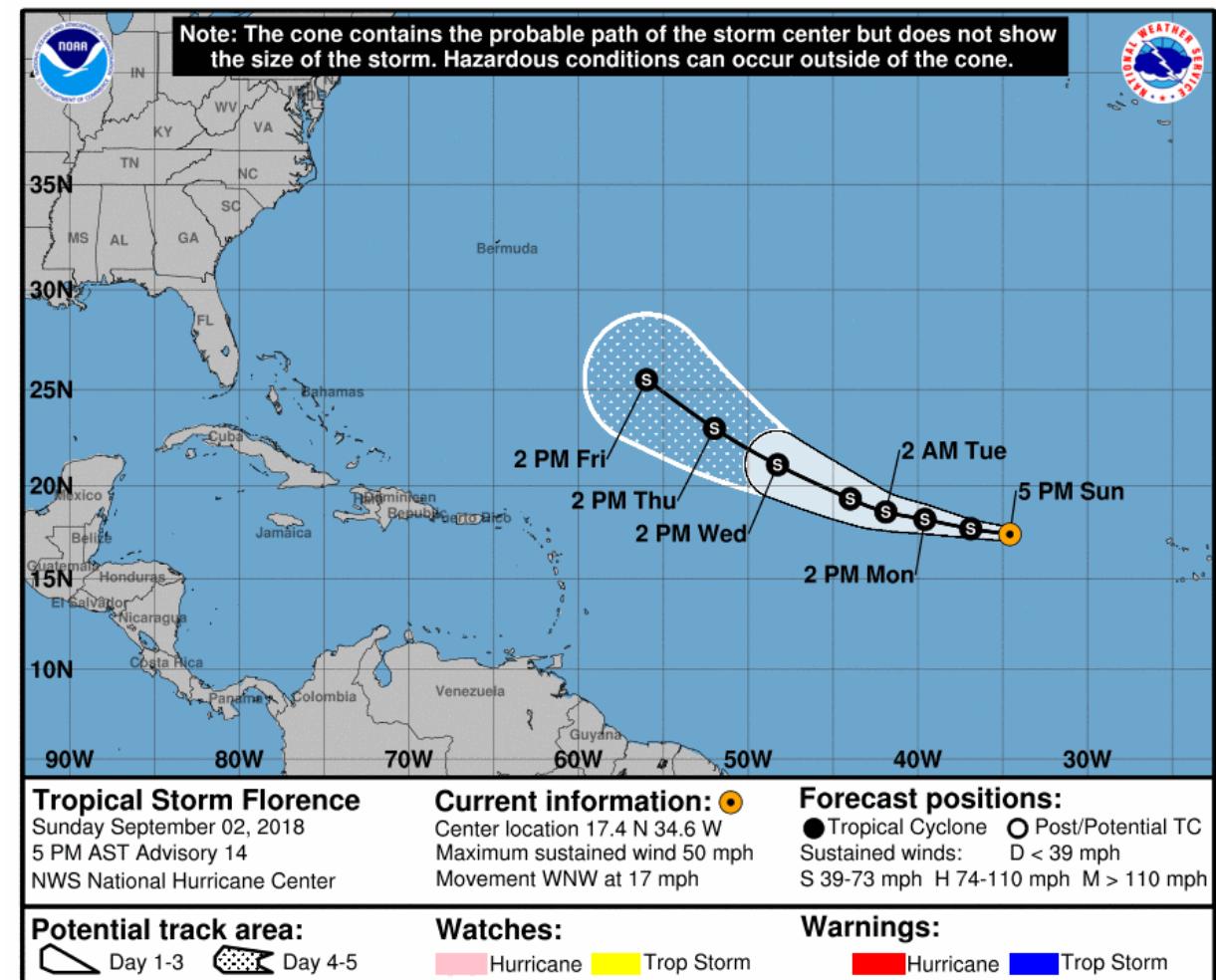
Background

- Optical energy is the energy measured by the Geostationary Lightning Mapper (GLM) from a lightning flash
- Flash extent density is the number of flashes within an area
- Average flash area is the area of each lightning flash on average
- Flash area and density have been studied for many years, but optical energy is has not been investigated as closely
- Rapid intensification is defined by the National Hurricane Center as an increase in sustained winds of 30 knots in 24 hours

Case Studies

Hurricane Florence

- Made landfall in North Carolina on September 14, 2018
- Underwent RI twice
 - 0600Z on September 4th - 1800Z on September 5th
 - 0600Z on September 9th - 1800Z on September 10th.



Case Studies

First RI Period:

Date	Time	Pressure (mb)	Wind Speed (kt)
04 September 2018	0600	989	65
	1200	986	70
	1800	982	75
05 September 2018	0000	975	85
	0600	968	95
	1200	960	105
	1800	950	115

Case Studies

Second RI Period:

Date	Time	Pressure (mb)	Wind Speed (kt)
09 September 2018	0600	988	60
	1200	984	65
	1800	979	70
10 September 2018	0000	973	80
	0600	967	90
	1200	954	105
	1800	940	120

Case Studies

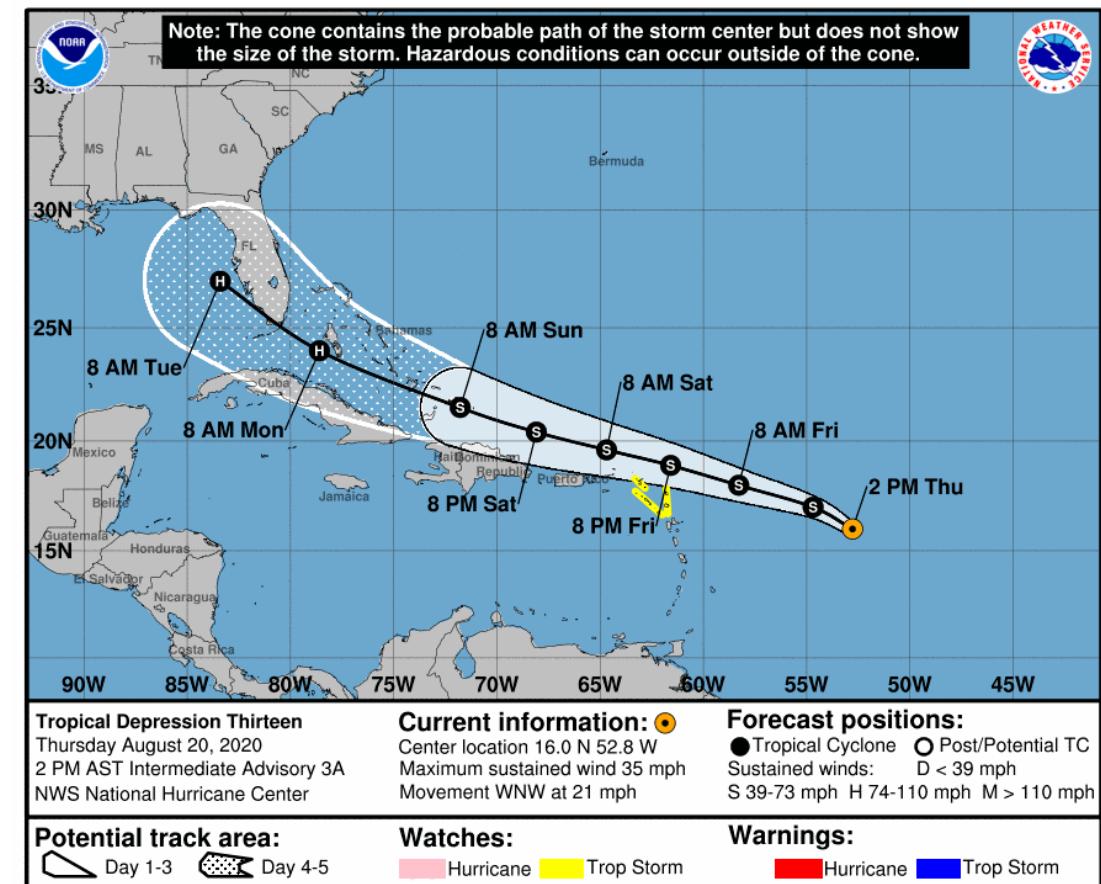
Second RI Period:

Date	Time	Pressure (mb)	Wind Speed (kt)
09 September 2018	0600	988	60
	1200	984	65
	1800	979	70
10 September 2018	0000	973	80
	0600	967	90
	1200	954	105
	1800	940	120

Case Studies

Hurricane Laura

- Made landfall in southwest Louisiana on 27 August 2020
- Underwent RI just prior to landfall



Case Studies

Date	Time	Pressure (mb)	Wind Speed (kt)
25 August 2020	0600	995	60
	1200	990	65
	1800	990	70
26 August 2020	0000	983	75
	0600	978	90
	1200	963	100
	1800	952	120
27 August 2020	0000	937	130

Case Studies

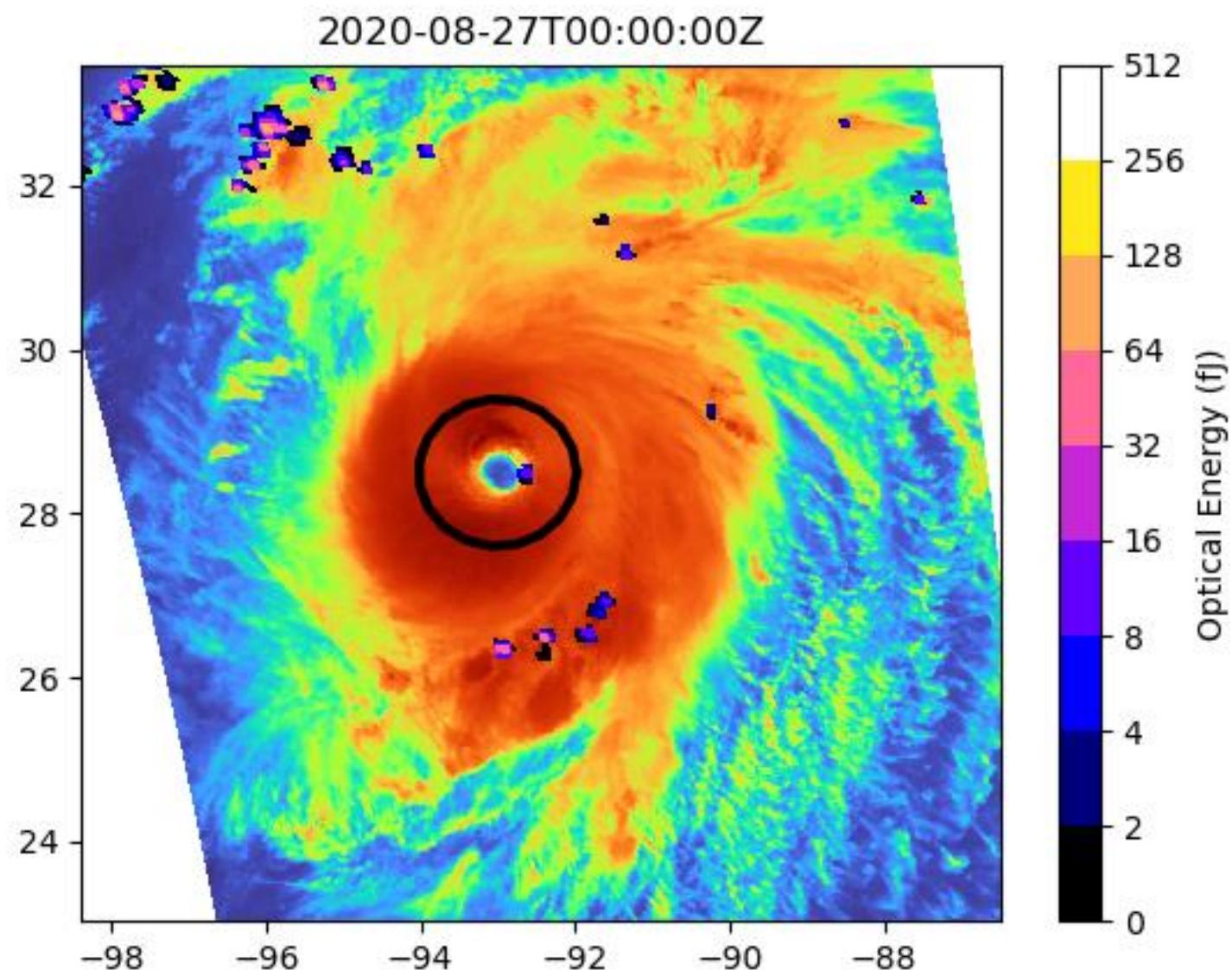
Date	Time	Pressure (mb)	Wind Speed (kt)
25 August 2020	0600	995	60
	1200	990	65
	1800	990	70
26 August 2020	0000	983	75
	0600	978	90
	1200	963	100
	1800	952	120
27 August 2020	0000	937	130

Goals

- Aim to better understand the relationship between optical energy and rapid intensification
- Does optical energy correlate with average flash area or flash extent density?
- Optical energy hasn't been studied extensively, so no conclusions have been drawn regarding the relationship between intensification and energy

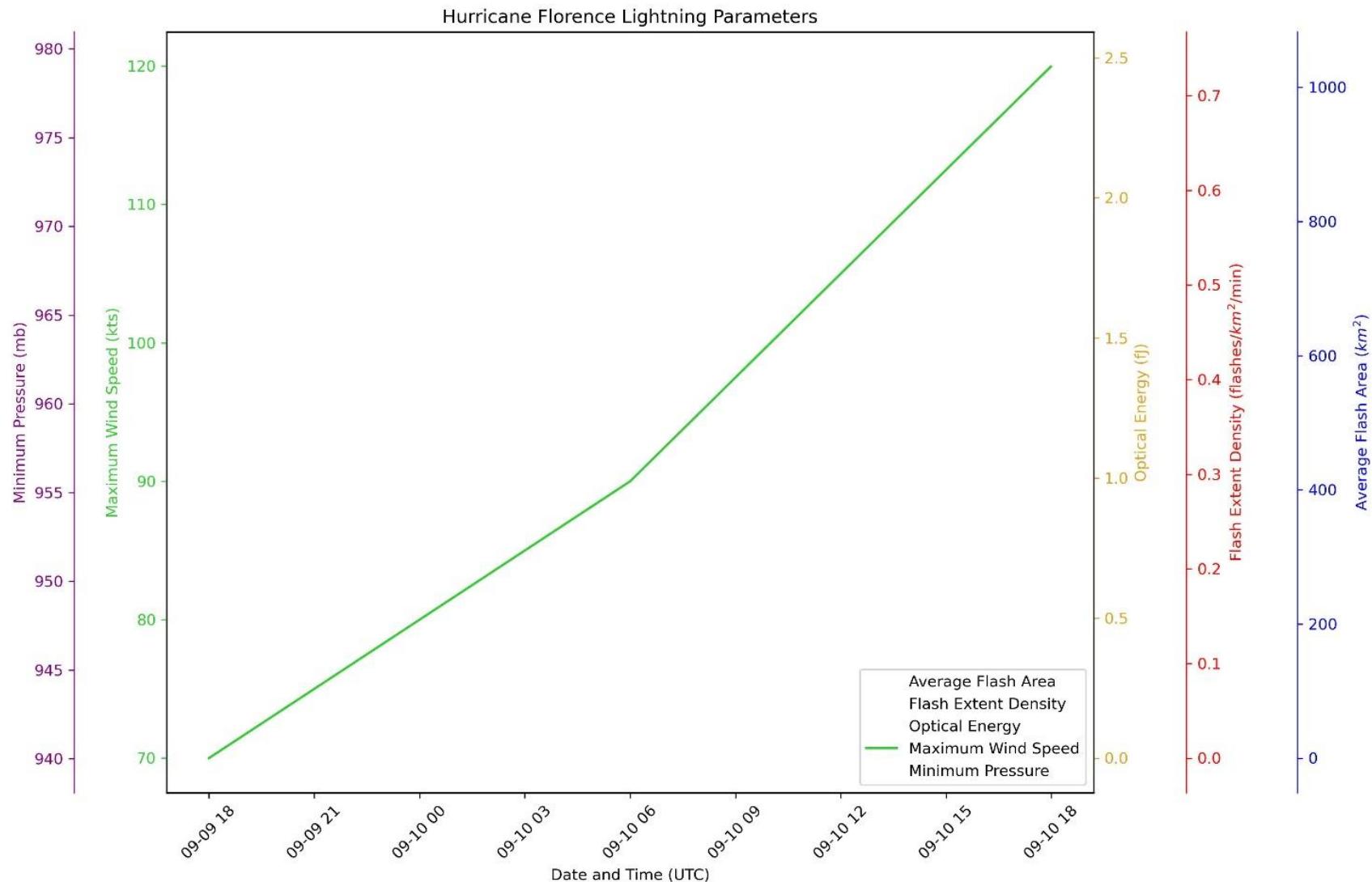
Data

- GLM on the GOES East satellite measures optical energy measurements at 1-minute resolution
- Focus was placed on the innermost 100 kilometers of the storms
- The data was averaged for each minute in the study period
- Specifically investigating a 24-hour period in which RI occurred

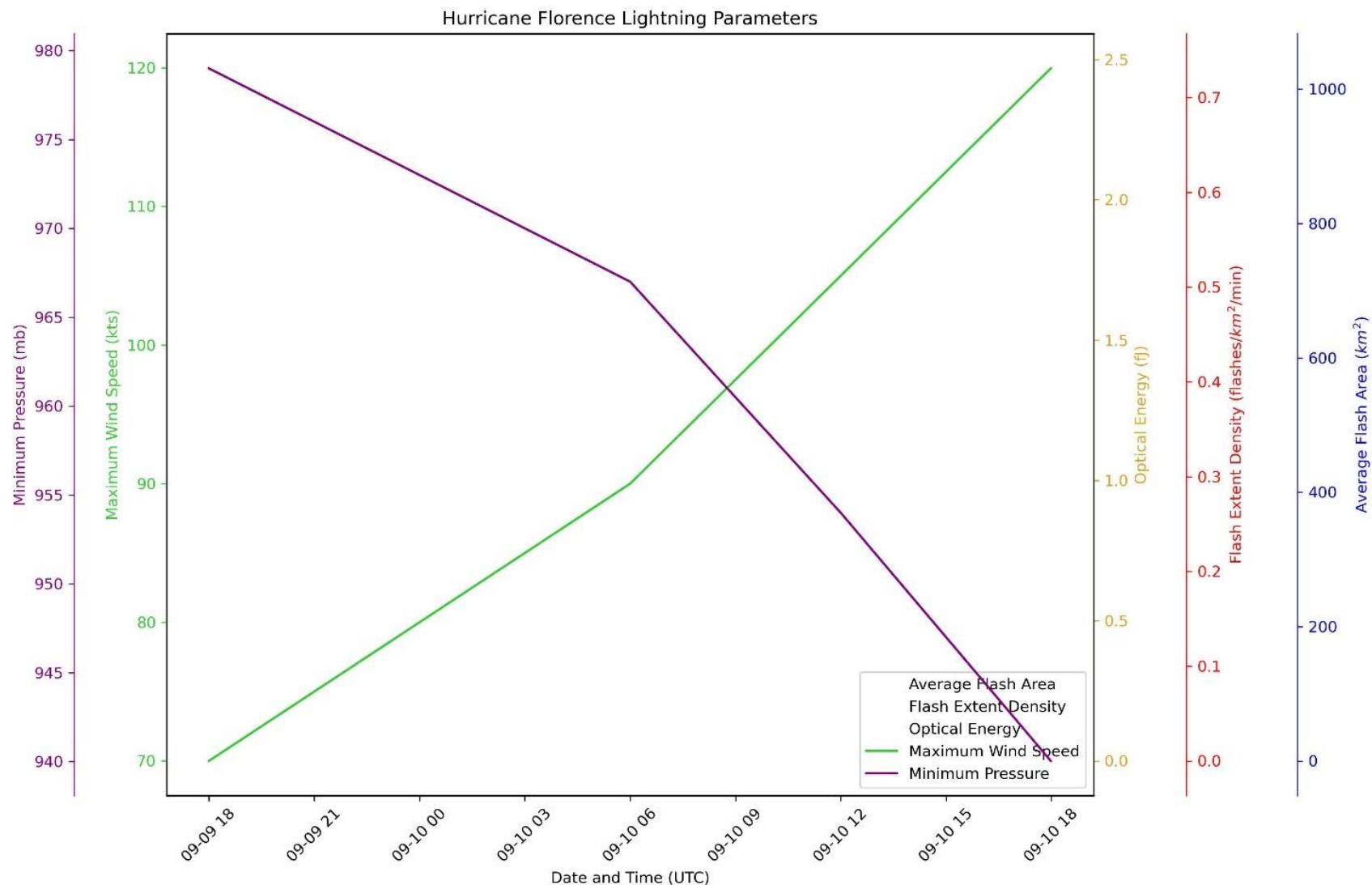


Hurricane Florence

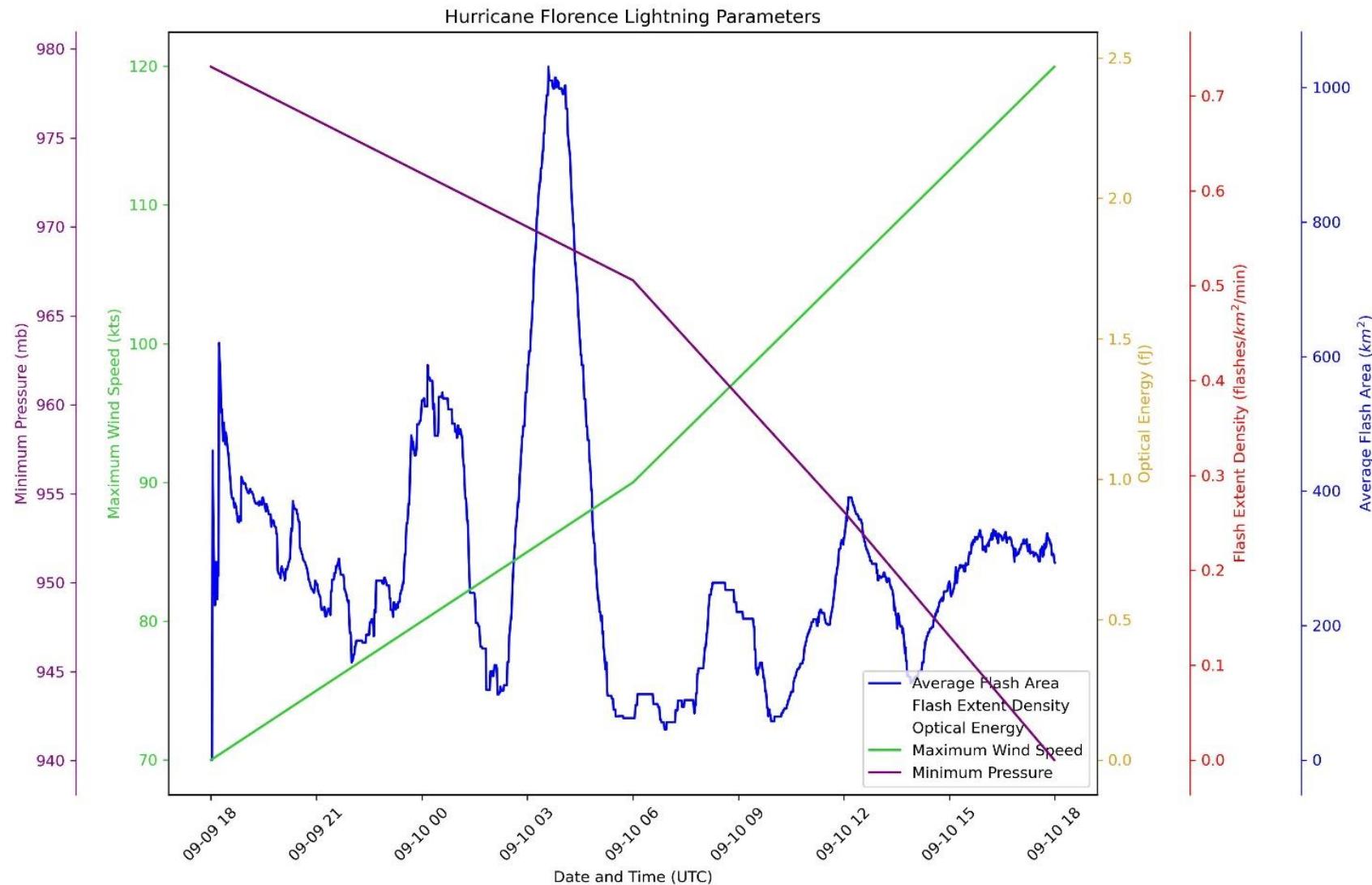
Hurricane Florence



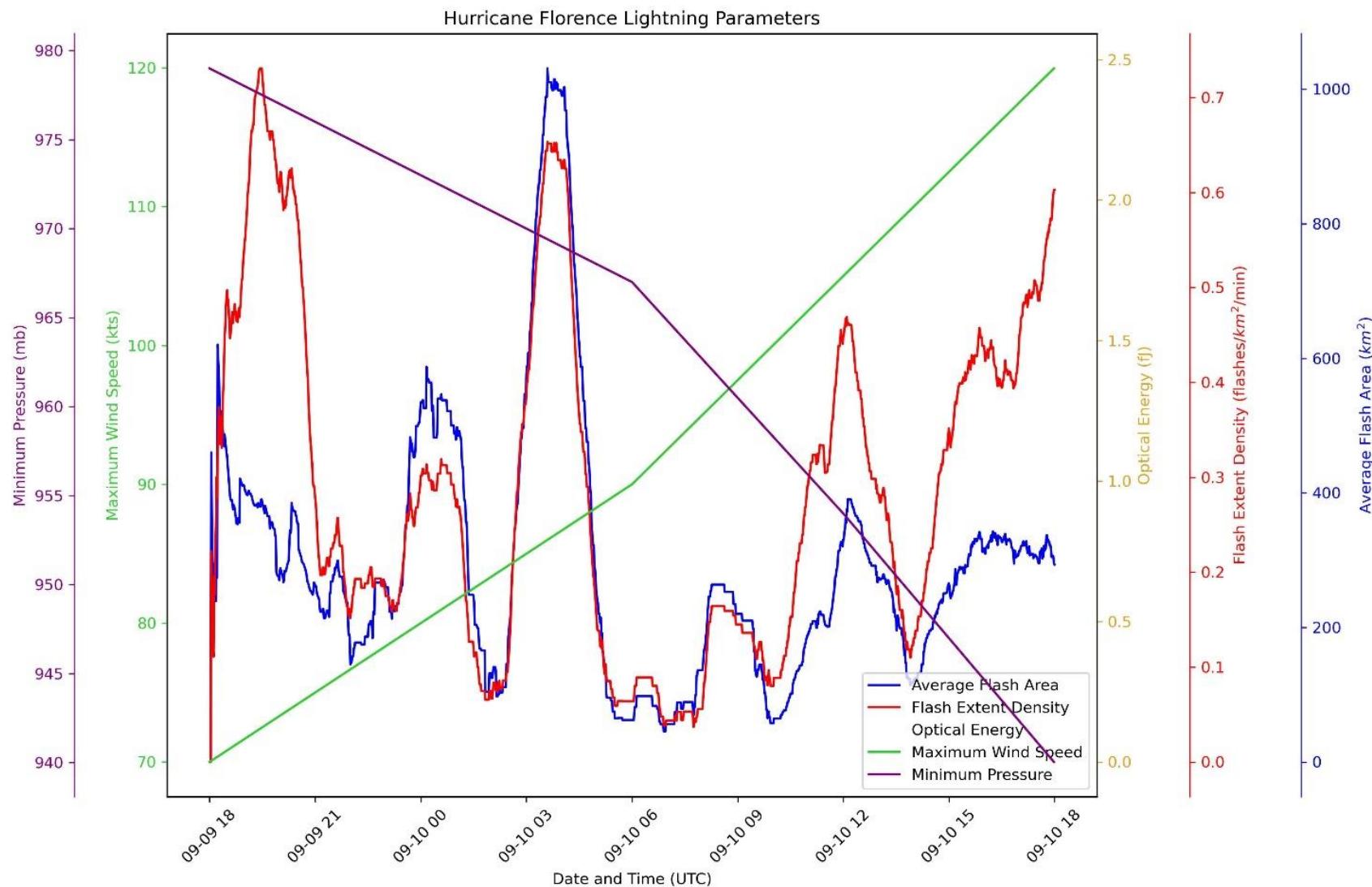
Hurricane Florence



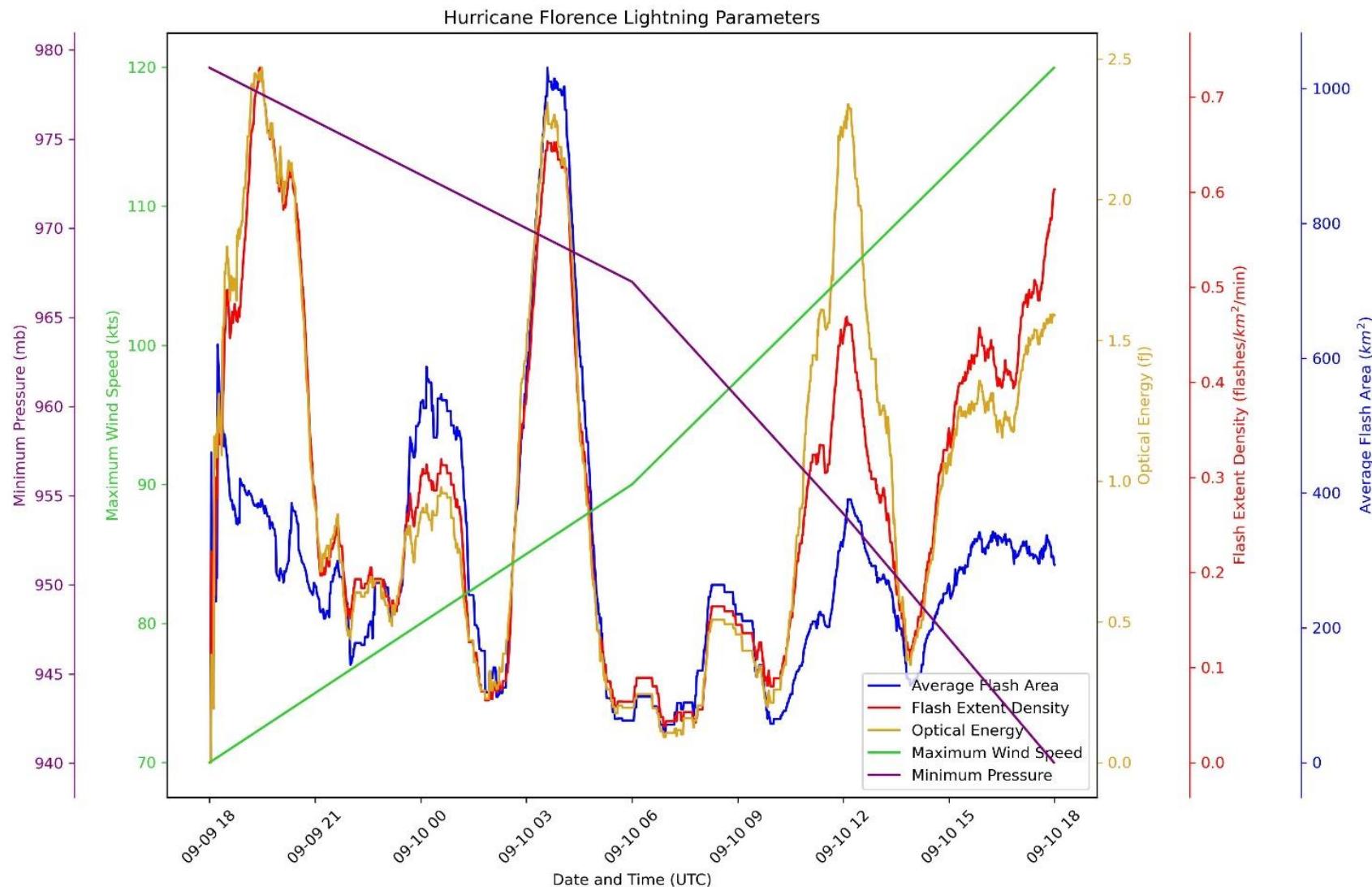
Hurricane Florence



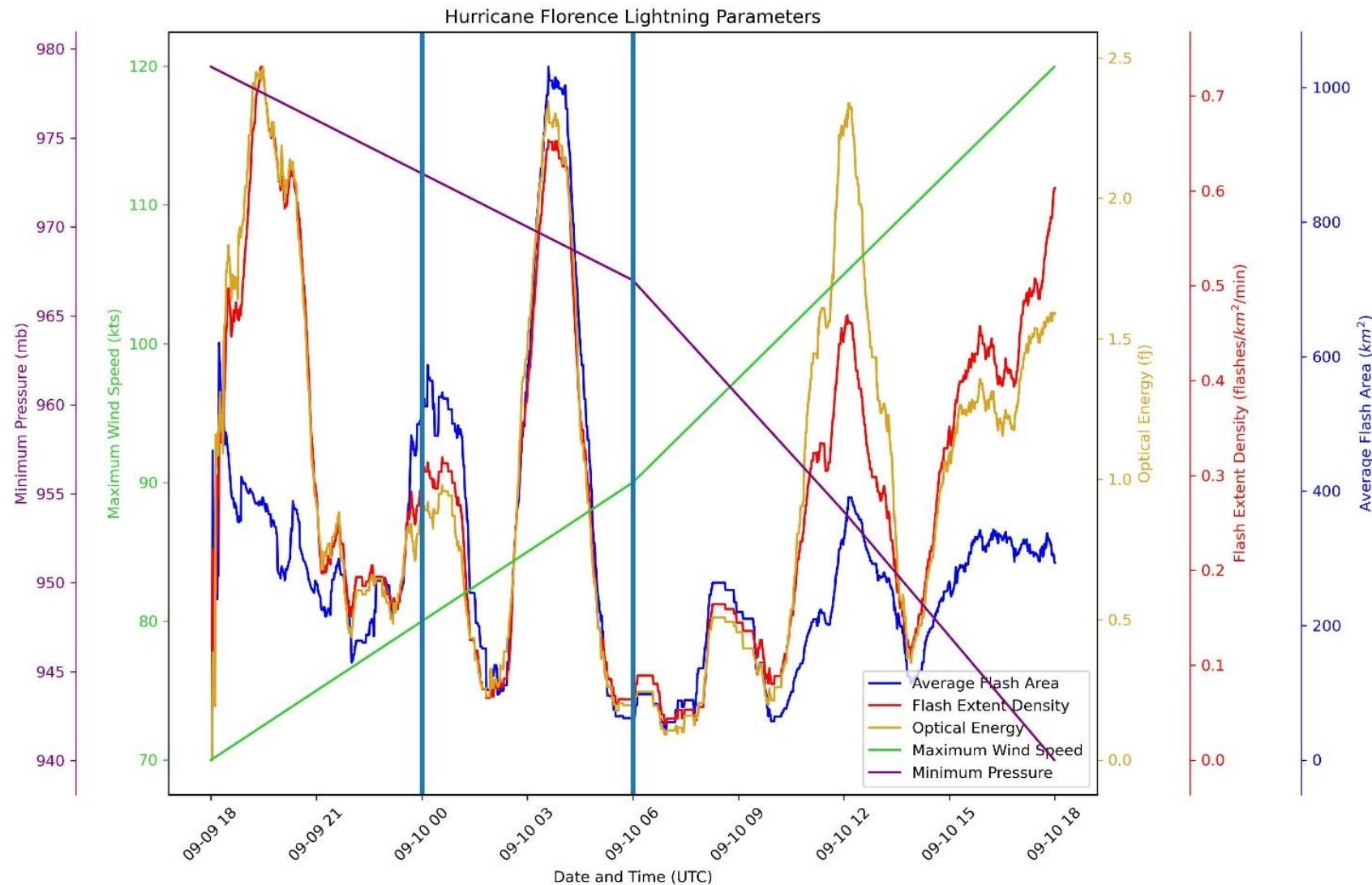
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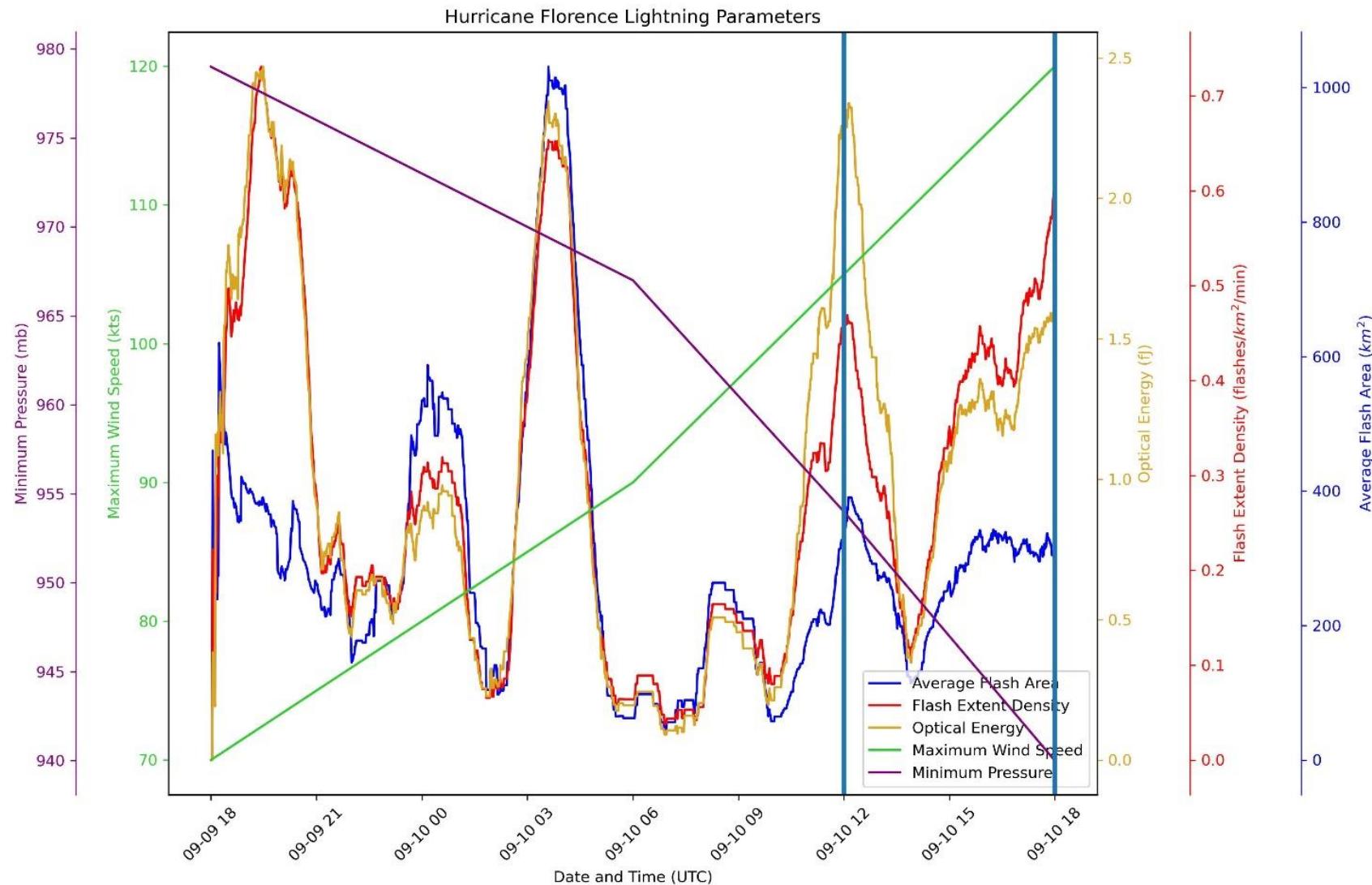
Hurricane Florence



Hurricane Florence

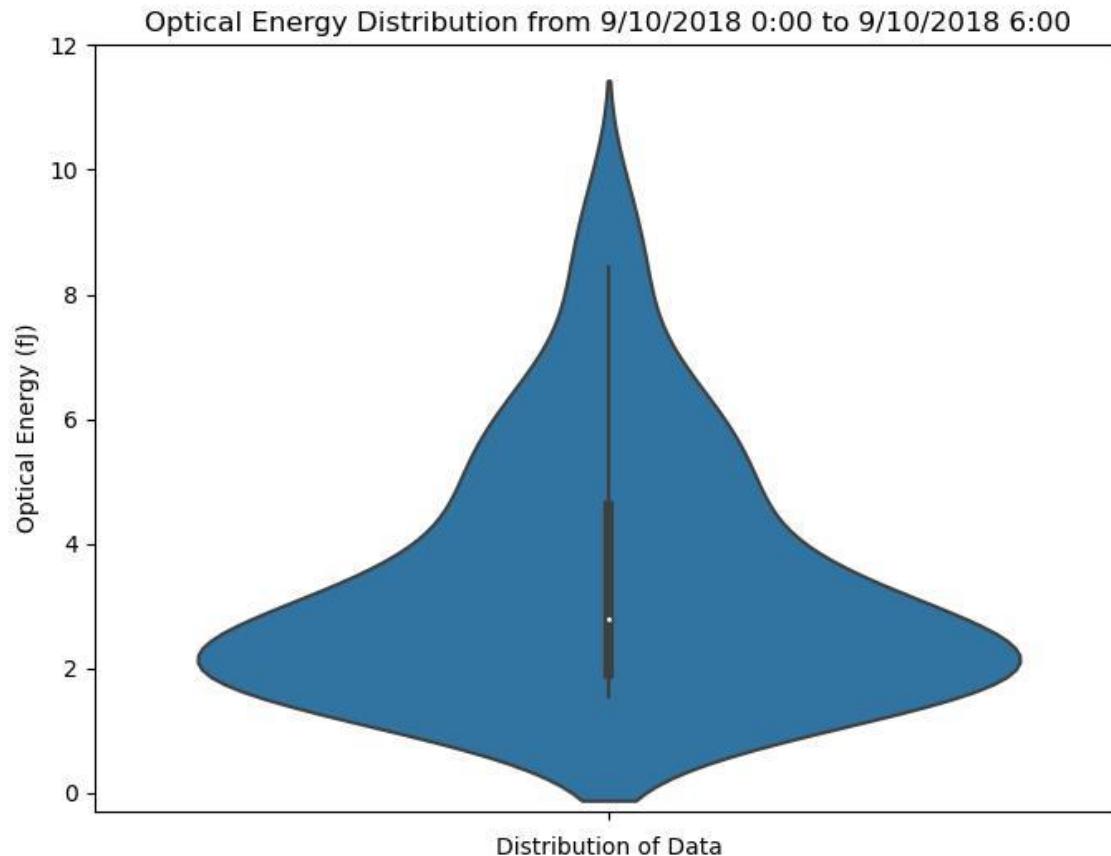


Hurricane Florence

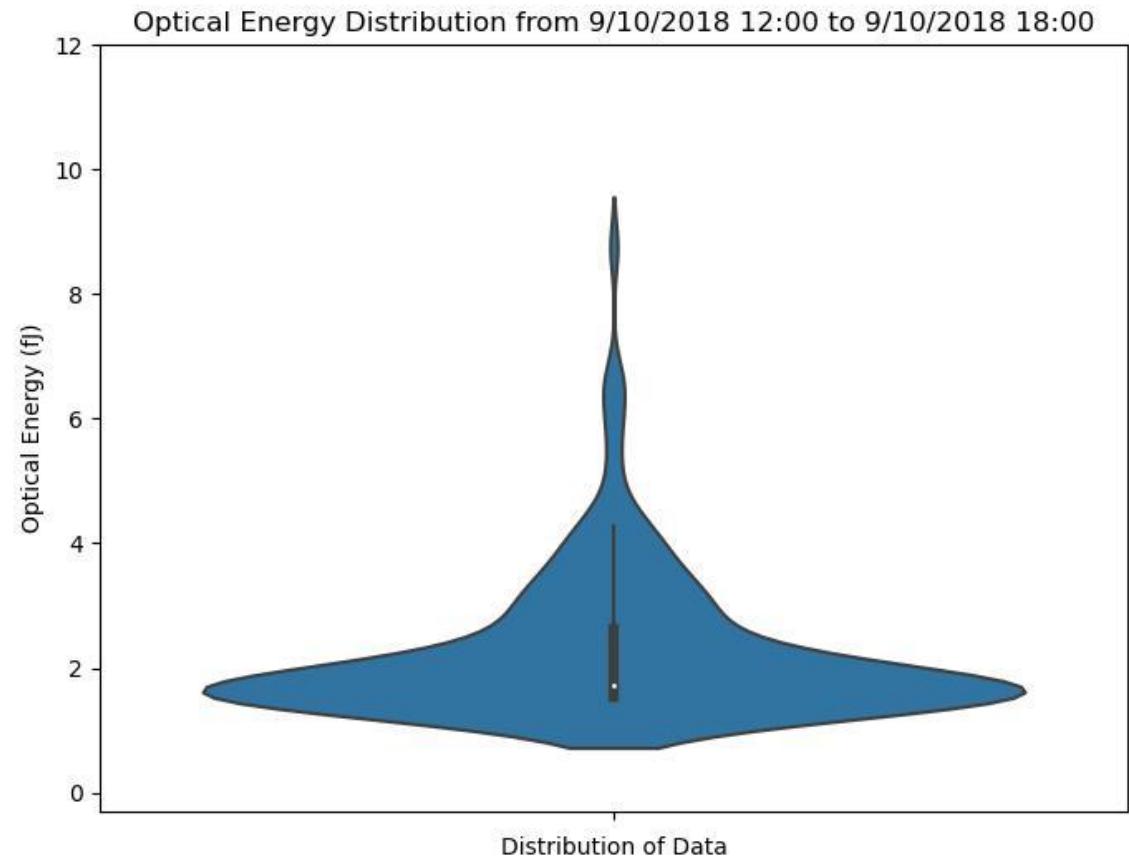


Hurricane Florence

Lower rate of intensification

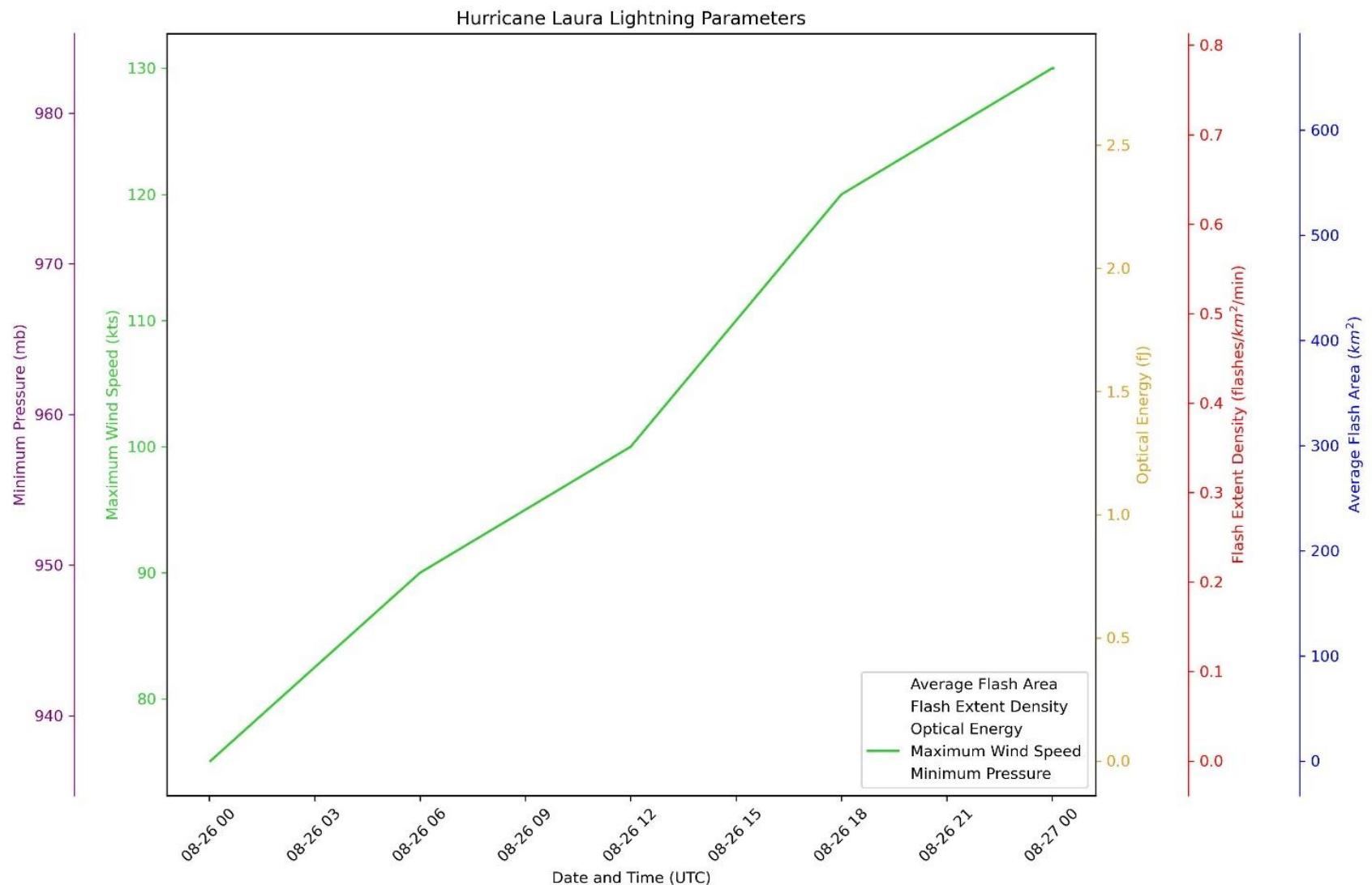


Higher rate of intensification

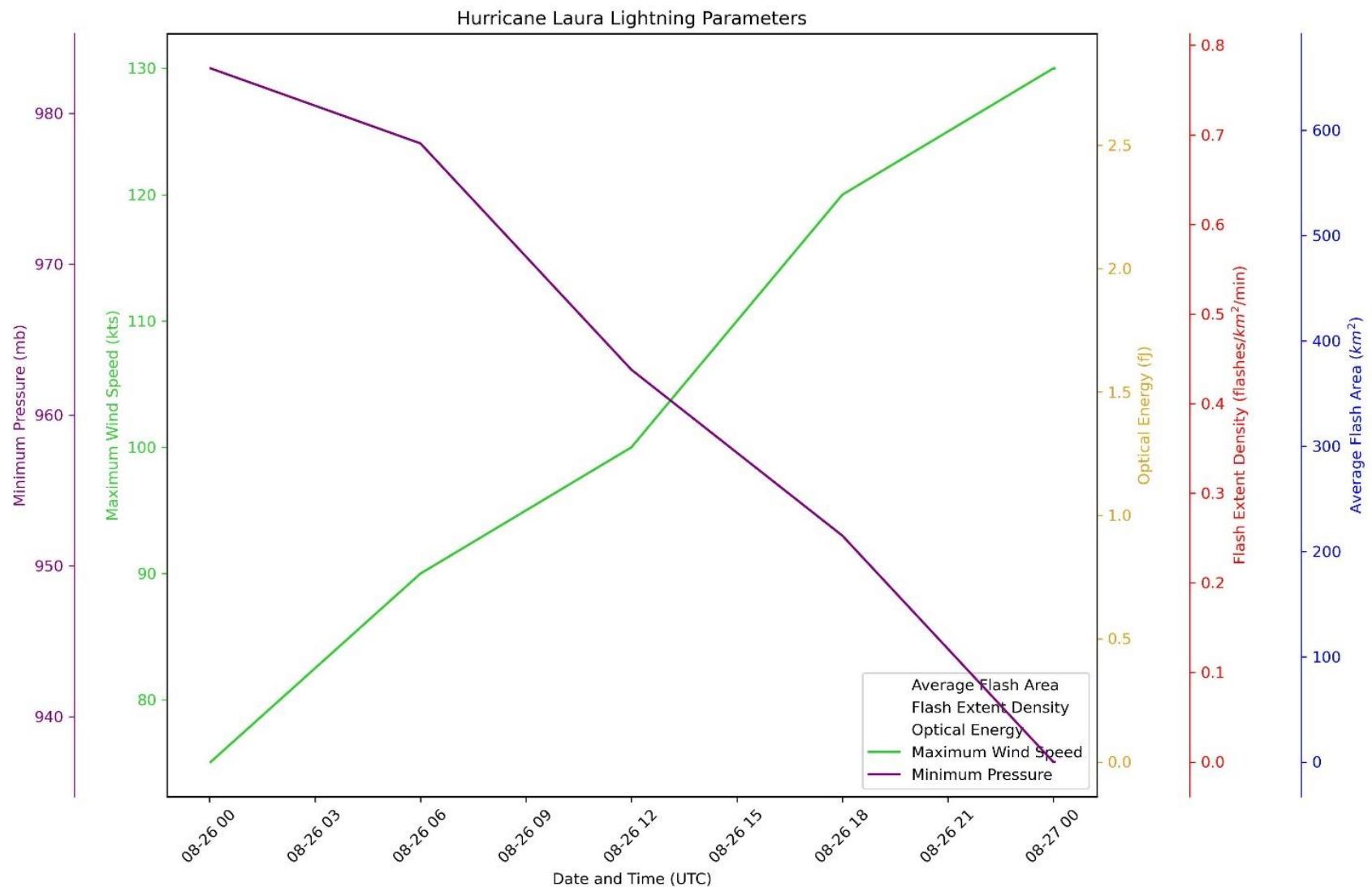


Hurricane Laura

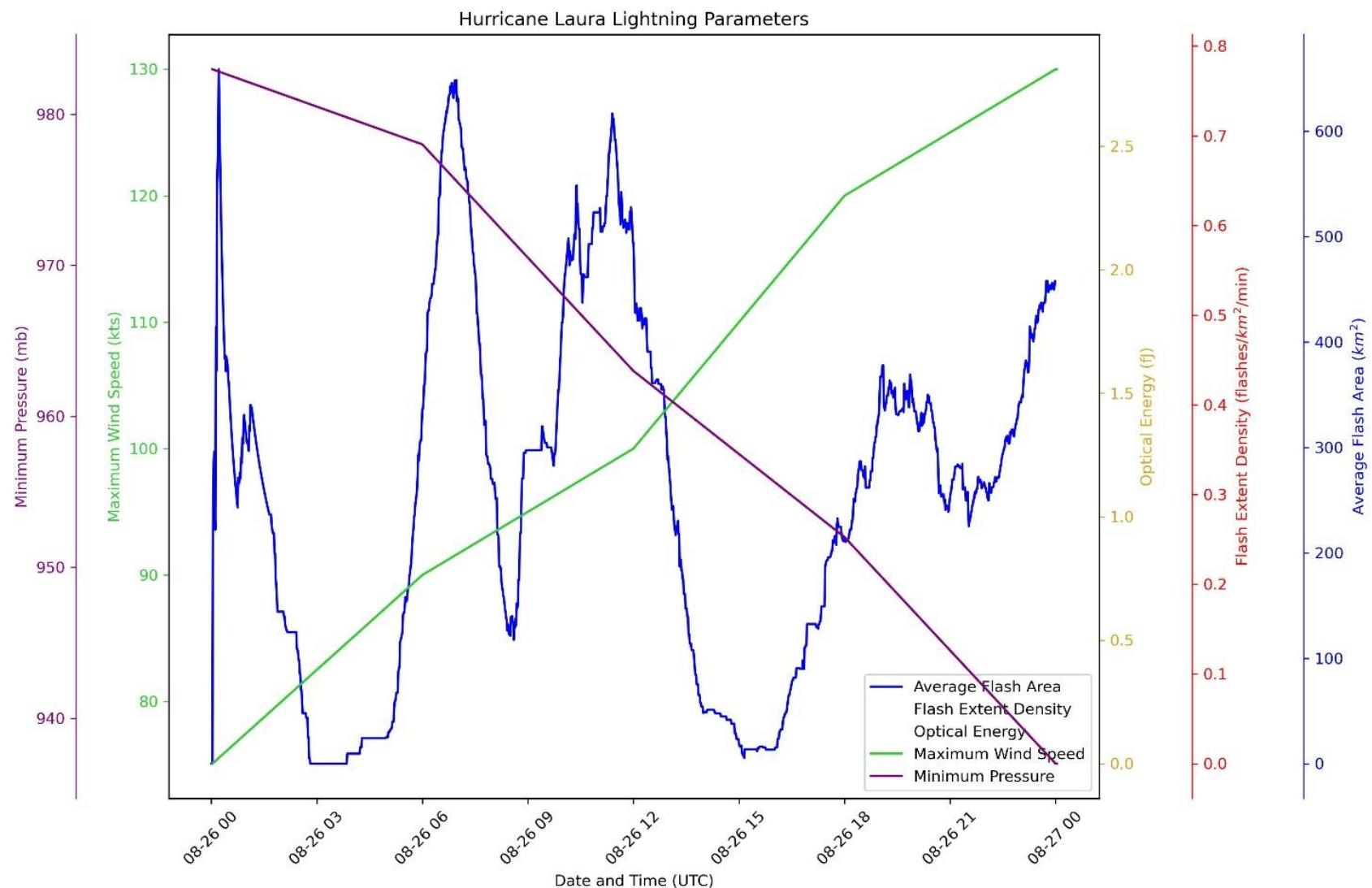
Hurricane Laura



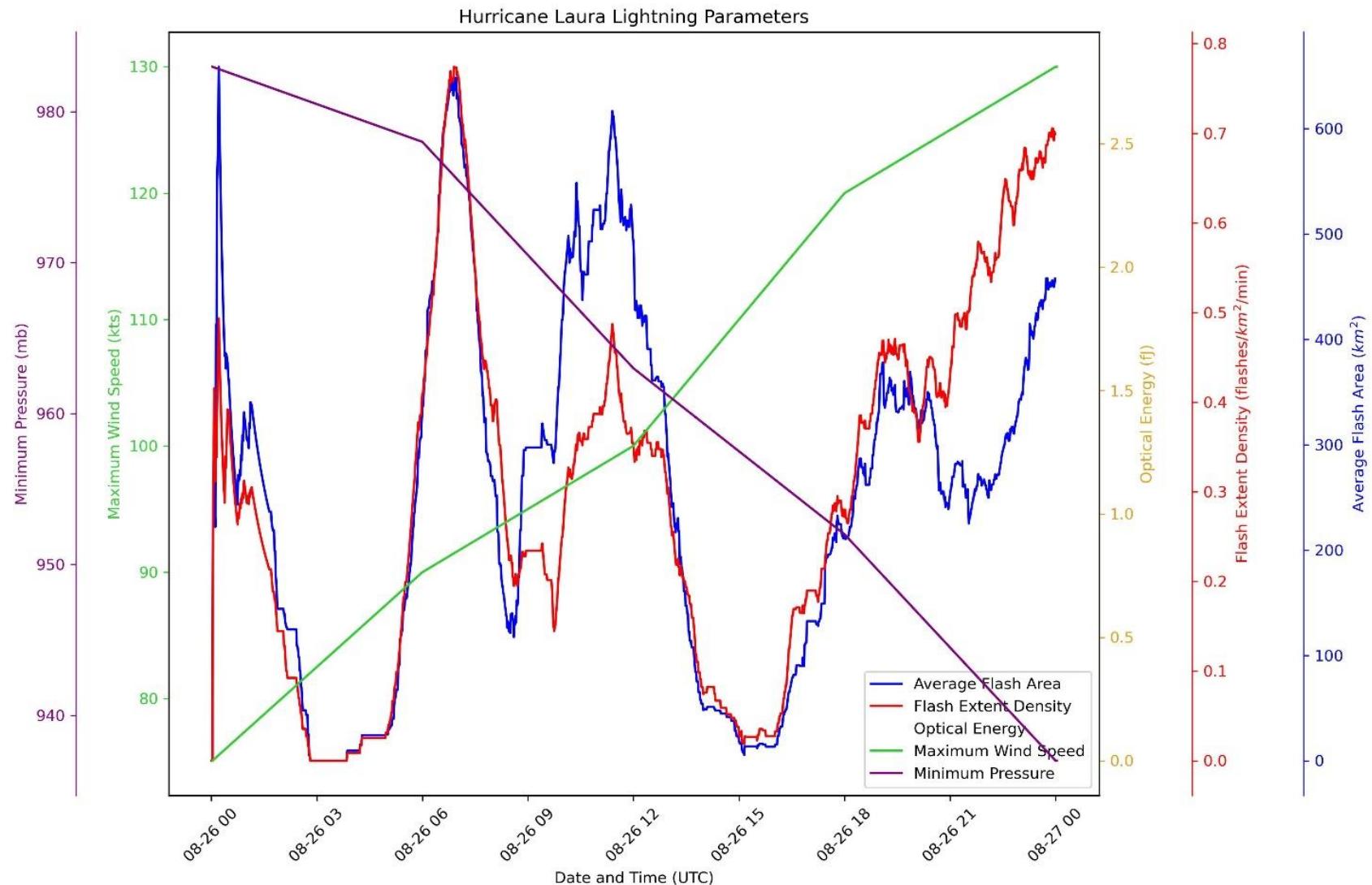
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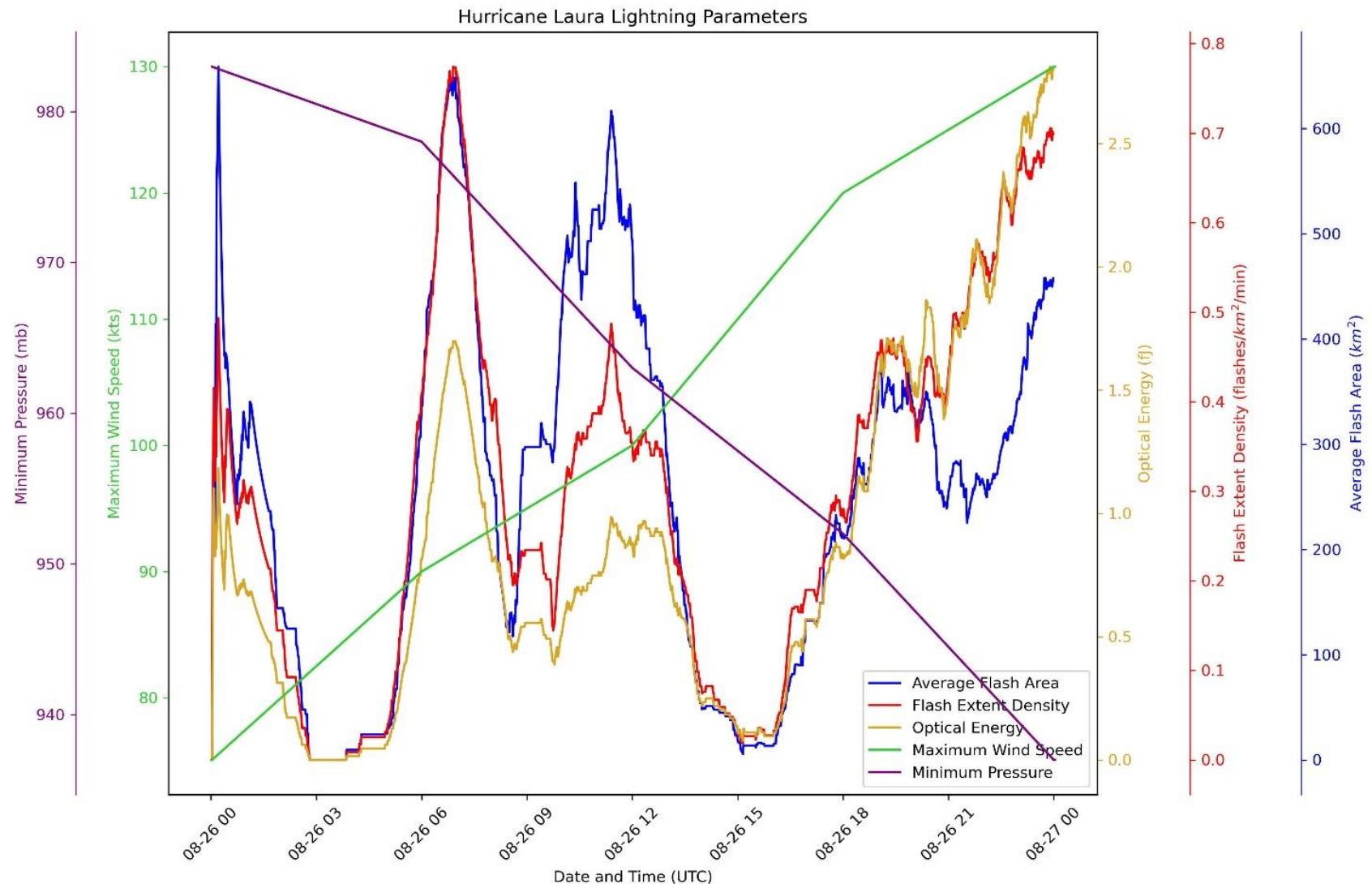
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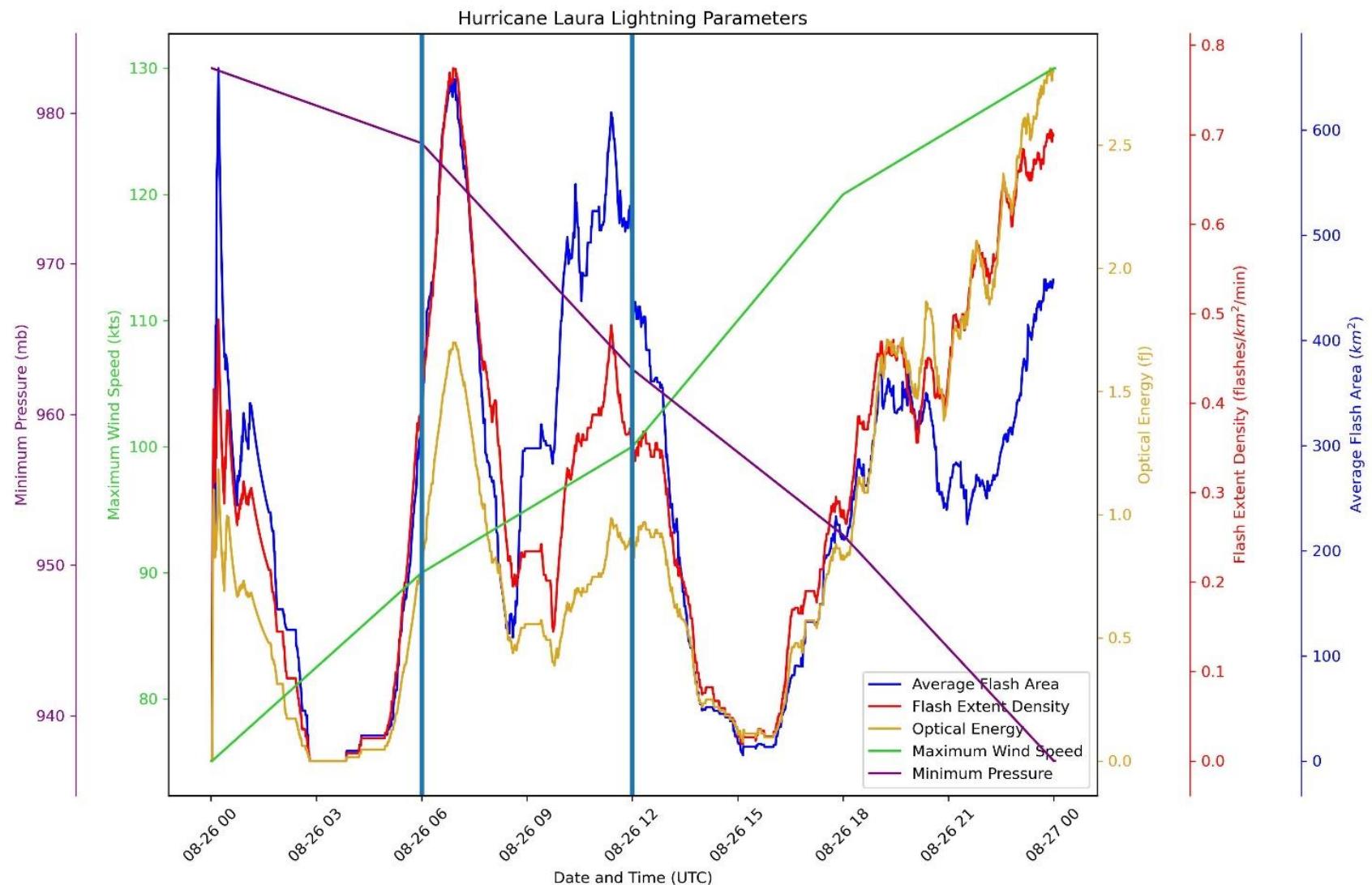
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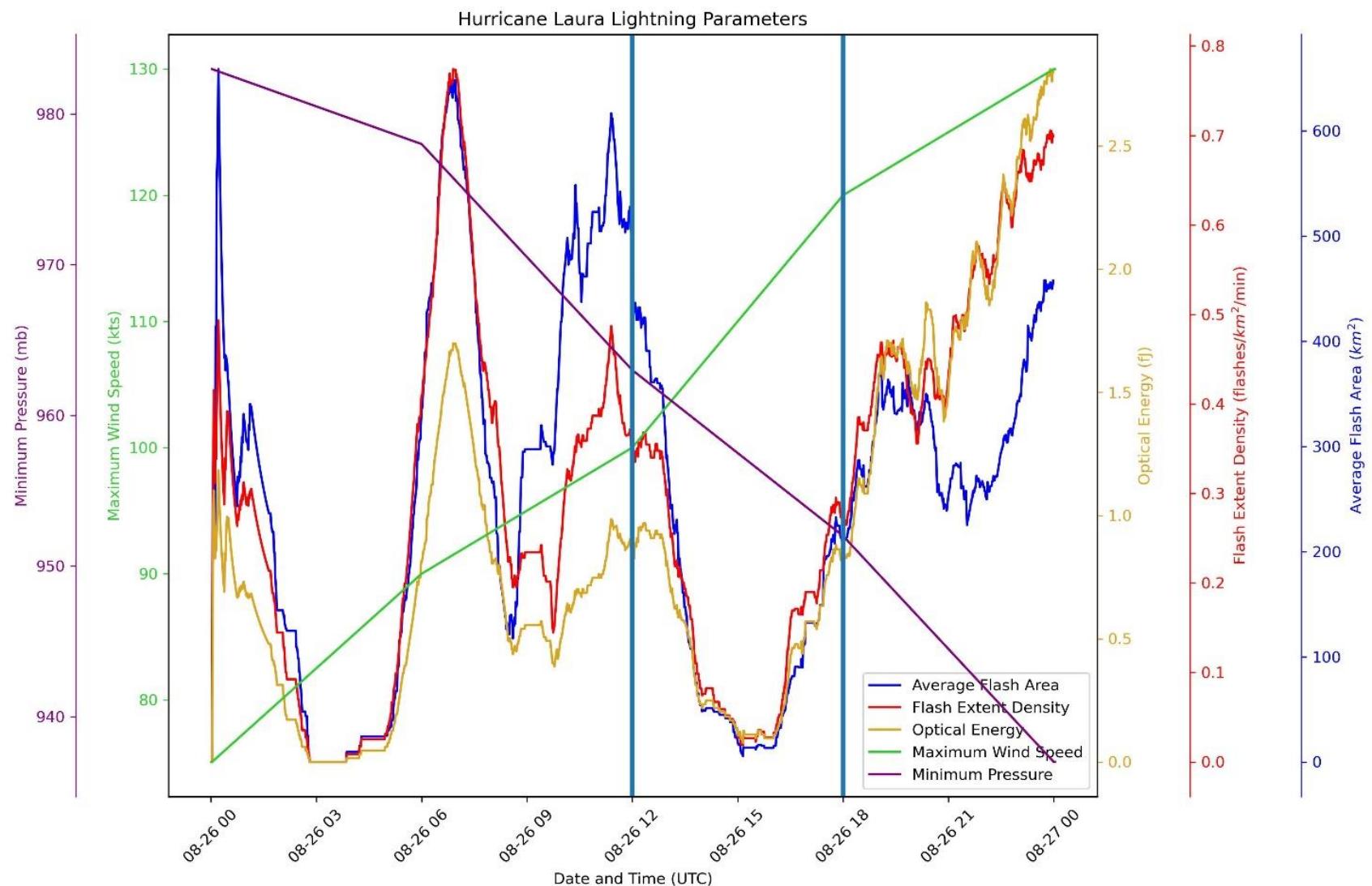
Hurricane Laura



Hurricane Laura

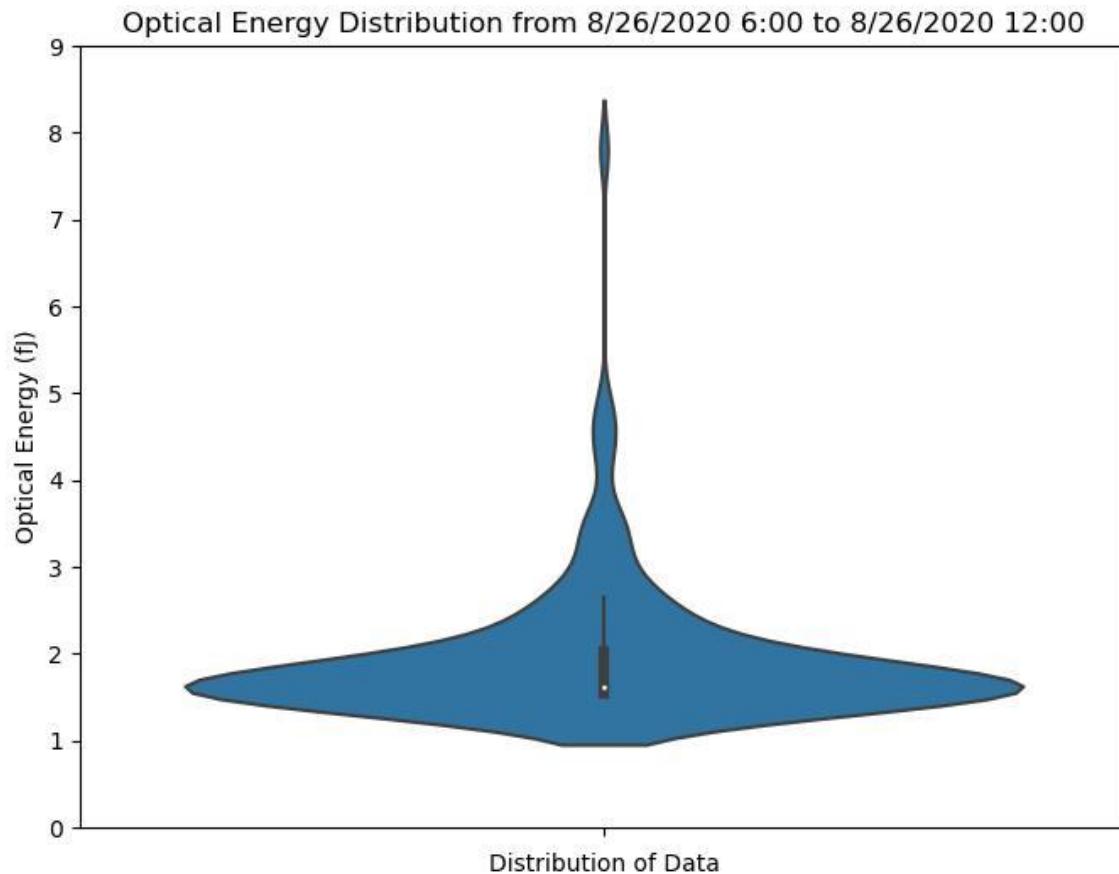


Hurricane Laura

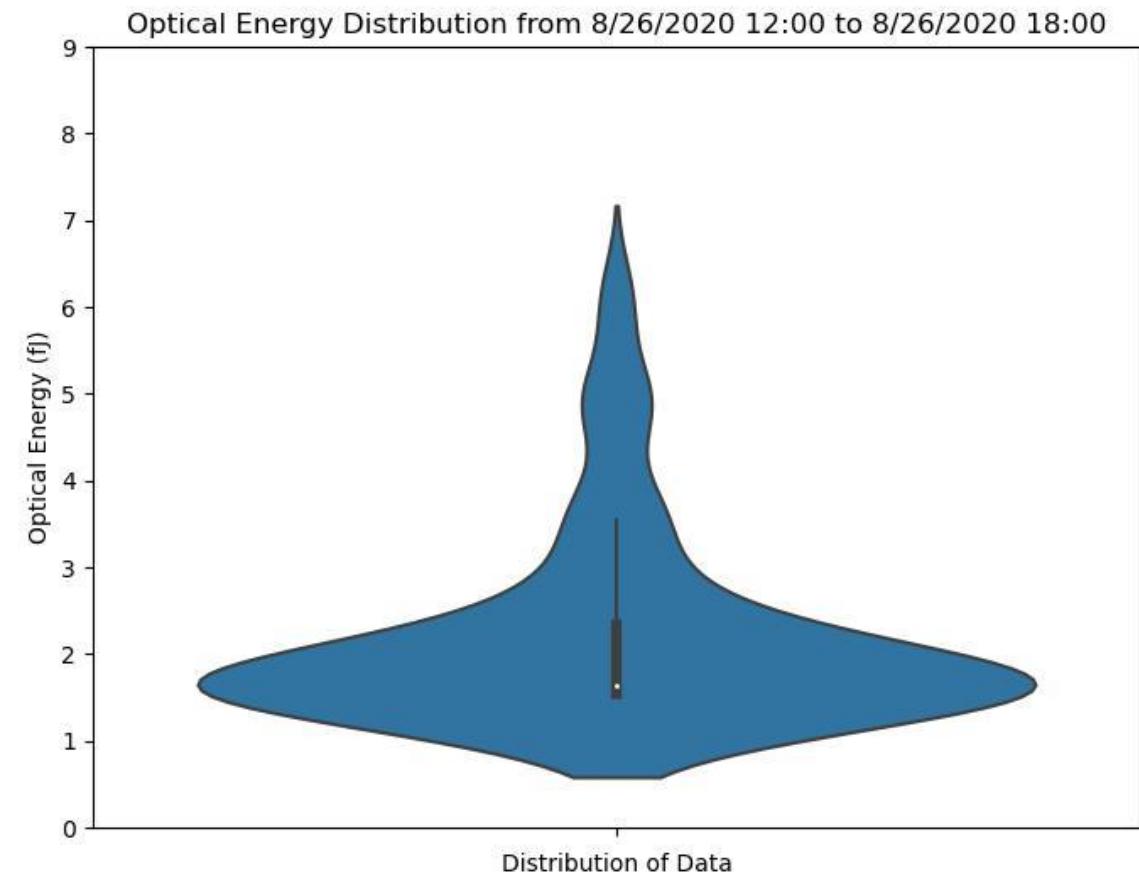


Hurricane Laura

Lower rate of intensification



Higher rate of intensification



Current/Future Work

- Investigating spatial distribution of the optical energy
- Plotting and assessing microwave imagery to get another more in-depth view at smaller-scale processes near the eye
- Specifically investigate the times that the energy peaks differently
- Possibly applying the same methods to storms that don't undergo RI to see if any trends seen are unique to RI

Contact

If you have any questions, comments, or suggestions, feel free to contact me at kiahnamollette@gmail.com

Thank you for your time!

